

VV&A Technical Working Group



NAVMSMO



Agenda

- NAVMSMO Introduction
- NAVMSMO Support Activities
- Importance of M&S VV&A
- Open Discussion



NAVMSMO Introduction

- Navy Modeling and Simulation Management Office (NAVMSMO), OPNAV N61M
 - Provide leadership and guidance for modeling policy, strategy, investment, and practices
 - Guide efforts to achieve the Navy's M&S vision
 - Maintain M&S information distribution system and catalog of Navy M&S resources
 - Establish policy; develop and/or maintain instructions and standards
 - Provide technical assistance
 - Identify, investigate and document M&S requirements



Introduction cont.

□ Responsibilities

- Serve as single point of contact on all M&S matters, and for coordination with the other service and DoD M&S organizations
 - Coordinate M&S issues within their respective service organization.
 - Provide representatives to M&S working groups
 - Maintain close coordination between Navy and Marine Corps M&S plans, programs, policies, and procedures

□ Policies

- SECNAVINST 5200.38A, DON M&S Management
- OPNAVINST 5200.34, Navy M&S Management
- SECNAVINST 5200.40A (TBD), DON M&S VV&A

NAVMSMO VV&A Support Activities





Status:

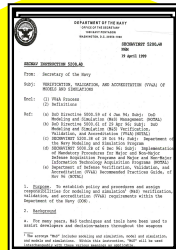
-VCNO

-CNO

-DASN C4I



M&S VV&A Activities



POLICY

Plan	Ref	Version	Document Type	Description of M&S
2011-04-11	11	ANNO	Accreditation Plan	The training exercise of the Training Material is developed as part of the ANNO program. The training material is used to train ANNO operators and as a training tool for the development of ANNO contacts.
2011-03-08	THE	ANNO-01	Accreditation Plan	USA VMSMO ANNO-01 Accreditation Plan for the ANNO-01 program.

ONLINE

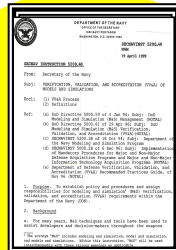
NAVMSMO

Status:

- Modifications
- Additions
 - Tutorial
 - Doc Tool
 - Limited Collaboration



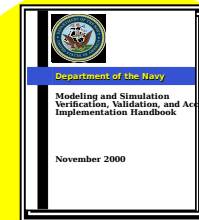
M&S VV&A Activities



POLICY

Date	Ref	System	Document Type	Document Title	Description of M&S
2001-04-11	11	ANCS	Accreditation Plan	Accreditation Plan for the Training Material	The Training Material
2001-04-11	11	ANCS	Accreditation Plan	Accreditation Plan for the Training Material	The Training Material
2001-04-11	11	ANCS	Accreditation Plan	Accreditation Plan for the Training Material	The Training Material

ONLINE



HANDBOOK

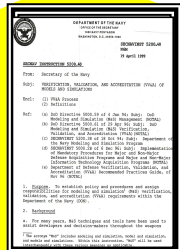
NAVMSMO

Status:

- Volume I released for informal review/comments
- Comments incorporated
- Ready for formal release
- Volume II, in the works



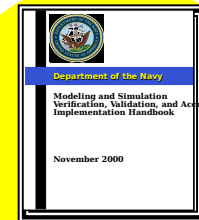
M&S VV&A Activities



POLICY

Date	Ref	System	Document Type	Document Title	Description of M&S
2001-04-11	11	AN-62	Accreditation Plan	Accreditation Plan for the Training Institute	The Training Institute was developed as part of the AN-62 program. The Training Institute is used to train AN-62 operators and as a platform for the development of AN-62 operators.
2001-03-08	THE	AN-62	Accreditation Plan	Accreditation Plan for the Training Institute	The Training Institute was developed as part of the AN-62 program. The Training Institute is used to train AN-62 operators and as a platform for the development of AN-62 operators.

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NAVMSMO

Status

-Viable Working Group

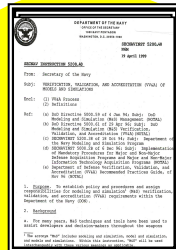
-More Navy Wide Participation



TWG



M&S VV&A Activities

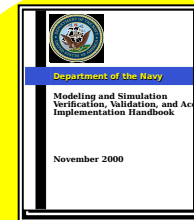


POLICY

NAVMSMO Plans and Reports on File With DONMSMO

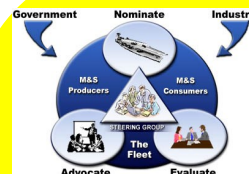
Date	Ref	System	Document Type	Document Title	Description of M&S
2001-04-11	11	AN-62	Accreditation Plan	Accreditation Plan for the Training Institute	The Training Institute was developed as part of the AN-62 program. The Training Institute is used to train AN-62 operators and as a means to ensure the quality of the training process.
2001-03-08	THE	AN-62	Accreditation Plan	Accreditation Plan for the Training Institute	The Training Institute was developed as part of the AN-62 program. The Training Institute is used to train AN-62 operators and as a means to ensure the quality of the training process.

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TAG



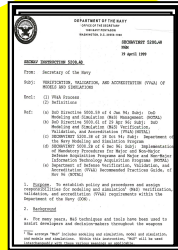
TWG

Status:

- SND 32 in Process
- SND 27/28 Approved



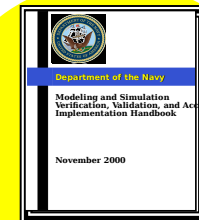
M&S VV&A Activities



POLICY

VV&A Plans and Reports on File With DONMSMO					
Date	ME	Version	Document	Document Title	Description of M&S
2001 04 13	11	ABCS	Accreditation Plan	Accreditation Plan for the Training Institute of the Army Medical Non-Operational System (AMNOS) - Support of Operational Evaluation (COPING) (27-4)	The training institute was developed as part of the AMNOS program. The training institute is used to train personnel who will be responsible for the maintenance and operation of the AMNOS program and the COPING (27-4) program.
2001 03 08	10	ABCS	Accreditation Plan	Accreditation Plan for the Training Institute of the Army Medical Non-Operational System (AMNOS) - Support of Operational Evaluation (COPING) (27-4)	USDA V&A Annual Call Report (M&S) (27-4) (M&

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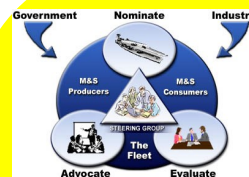
Status:

-Ver 1, in NMCI Approval Process

-Ver 2, release Jan/Feb



TOOLS



TAG



TWG

Importance of M&S and VV&A





Why Use M&S?

- ❑ Study the things that can not be easily realized without danger
- ❑ New policy/procedures/doctrine can not be explored without disrupting existing system
- ❑ New components can be tested without actual system in place
- ❑ Hypotheses can be tested
- ❑ Time can be compressed or expanded to speed up or slow down events under investigation
- ❑ Identify bottlenecks
- ❑ “What if” analysis can be conducted



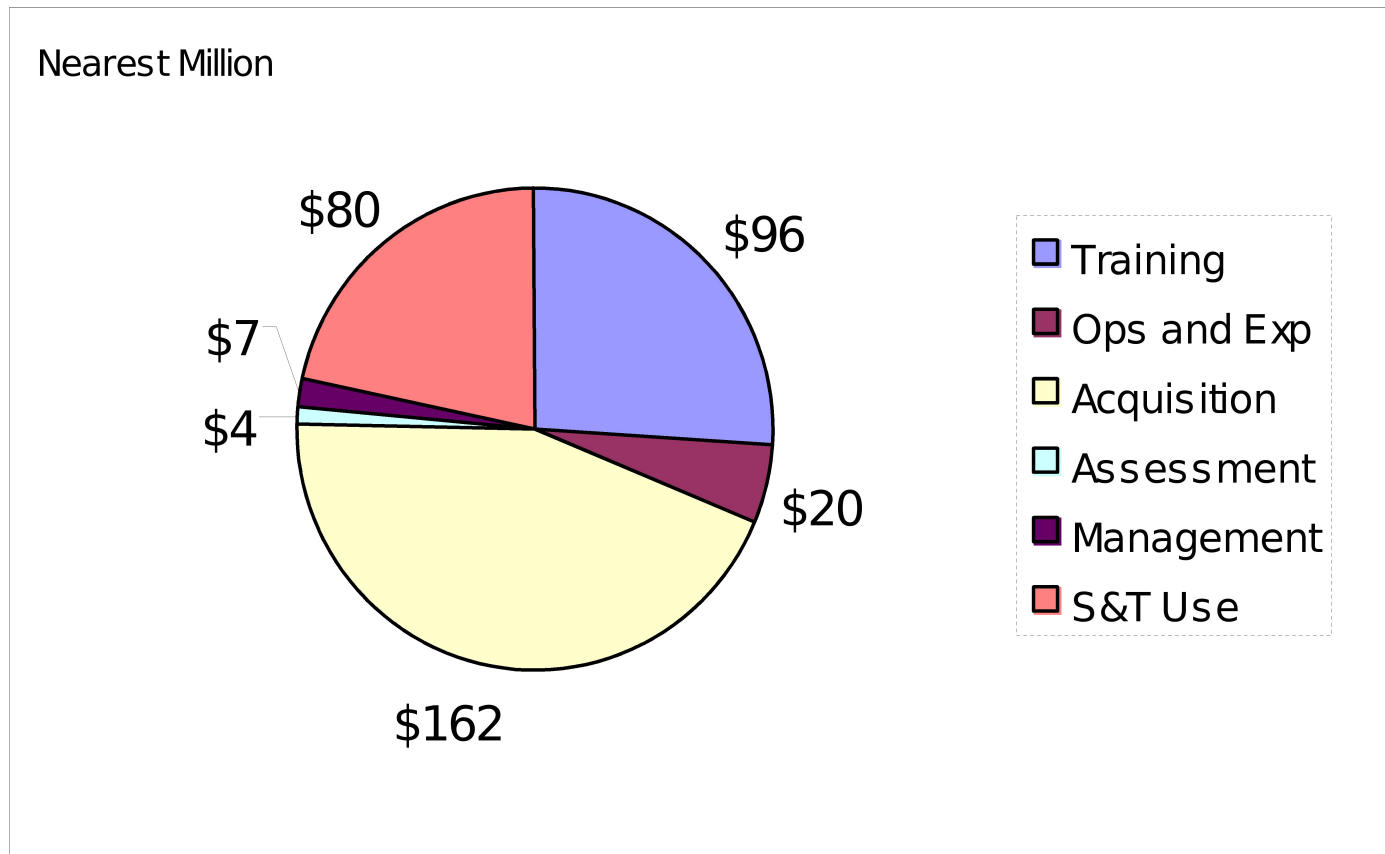
M&S In Use Throughout Navy

- ❑ Assessment and Analysis
- ❑ Doctrine and Experimentation
- ❑ Environment
- ❑ Intelligence
- ❑ Joint Requirements, Force Protection
- ❑ Logistics
- ❑ Manpower and Personnel
- ❑ Medicine and Surgery
- ❑ Science and Technology Requirements
- ❑ Test and Evaluation, Acquisition
- ❑ Training, Training Systems and Education



\$\$\$\$

- Where is money being spent on M&S in the Navy?



NAVMSMO Baseline Study FY2002



VV&A Definitions

Accreditation - The official certification that M&S and its associated data are acceptable for use for a specific purpose.

Verification – The process of determining M&S implementation and its associated data accurately represent the developer's conceptual description and specifications.

Validation – The process of determining the degree to which an M&S and its associated data are an accurate representation of the real world from the perspective of the intended uses of the model.



Why Do VV&A?

- Gain confidence in M&S development process
- Identify problems early and feedback solutions
- Determine M&S assumptions, capabilities, and limitations
- Remove bias from acceptability determination
- Ensure M&S is used for right purpose
- Make informed decisions based upon M&S results



Why VV&A Is Important

- **Investments:** Navy depending and spending more and more on M&S
- **Reuse:** By implementing VV&A now, M&S may be reused more in the future
- **Cost Savings:** Reduce reinvention and reengineering through reuse



Summary

- TWG Participation
 - Product Development
 - Need Input from TWG
- Changes to TWG
 - Governing Body:
 - to Needs a Identify and Solutions
 - to Define/Refine TWG Process

VV&A Tutorial

VV&A Policy, Process, Roles and Responsibilities



NAVMSMO



Outline

- Introduction
- Policy
- VV&A Process
- VV&A Roles & Responsibilities
- Support Activities
- Summary
- Open Session Discussion



Why VV&A?

□ Introduction

- Build credibility and confidence in the use of modeling and simulation (M&S)
- Reduce risks of using M&S
- Contain costs
- Support reusability
- Satisfy policy requirements



POLICY



M&S Management Policy

- ❑ DoD Directive 5000.59, Department of Defense (DoD) M&S Management, 4 Jan 1994
- ❑ SECNAV Instruction 5200.38A, Department of the Navy (DON) M&S Management, 28 Feb 2002
- ❑ OPNAV Instruction 5200.34, Navy M&S Management, 28 May 2002



M&S VV&A Policy

- DoD Instruction 5000.61: DoD M&S Verification, Validation, and Accreditation (VV&A), 13 May 2003
 - Applies to all M&S developed, used, or managed by DoD Components
 - Applies to all M&S used in support of Operational Test and Evaluation (OT&E)
- SECNAV Instruction 5200.40A: Verification, Validation, and Accreditation of Models and Simulations, being staffed for final approval
 - Applies to all DON organizations involved with M&S activities
 - Applies to all categories of M&S used by DON activities
 - Consistent with SECNAVINST 5200.38A and DoDI 5000.61



VV&A Definitions

- **Accreditation.** The official certification that M&S and its associated data are acceptable for use for a specific purpose. ***(Formally documented in the Accreditation Report and Accreditation Decision Letter.)***
- **Verification.** The process of determining that an M&S implementation and its associated data accurately represent the developer's conceptual description and specifications. ***(Formally documented in the V&V Report.)***
- **Validation.** The process of determining the degree to which an M&S and its associated data are an accurate representation of the real world from the perspective of the intended uses of the model. ***(Formally documented in the V&V Report.)***



What Needs VV&A?

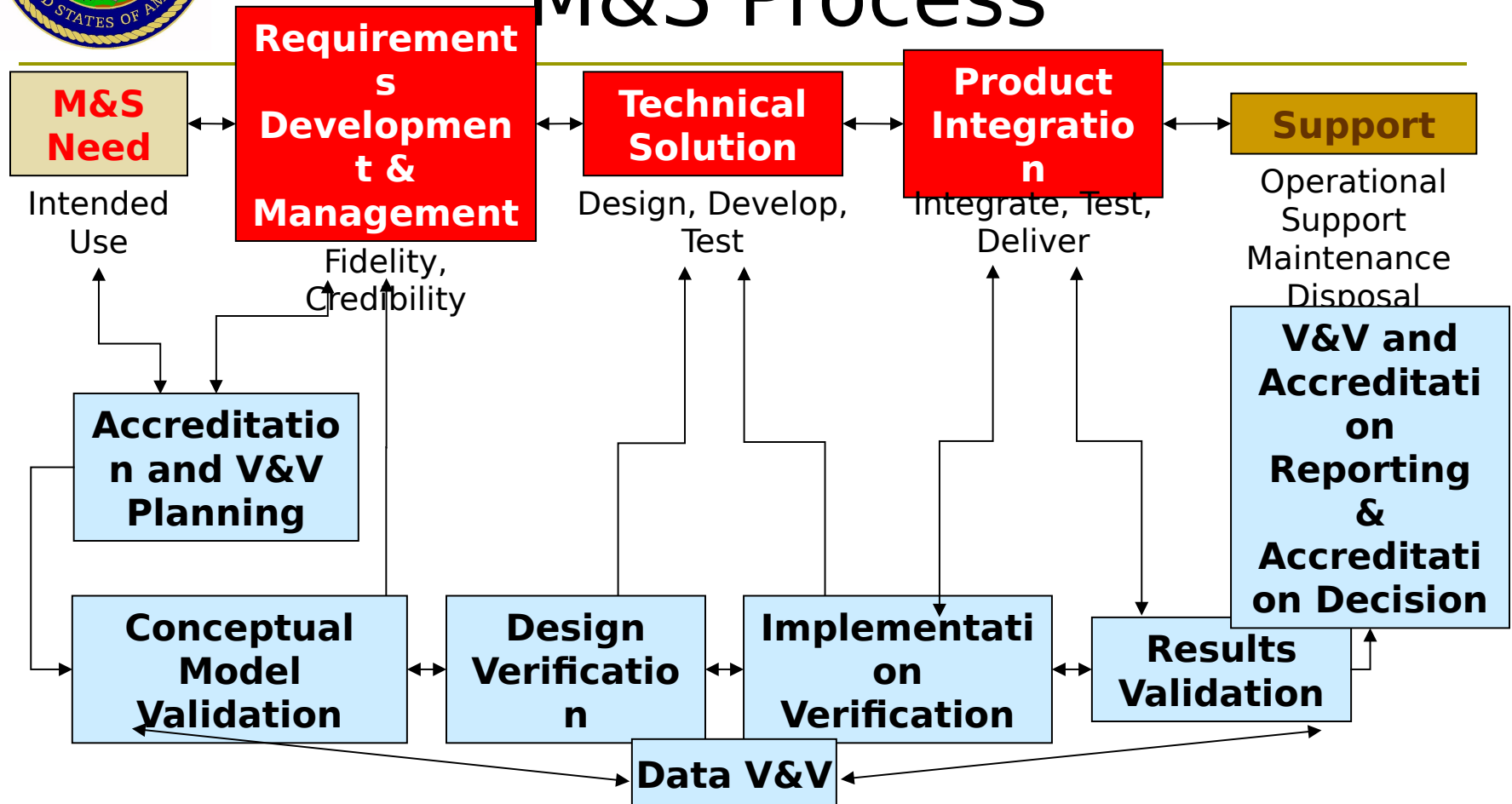
- All M&S acquired, developed, managed, and used by DON activities
 - Live, virtual, and constructive simulations; distributed simulations; federates and federations; emulators; prototypes, simulators; and stimulators.
 - Legacy systems, new developments, and modified or enhanced legacy M&S. Include but not limited to embedded and stand-alone M&S.
 - M&S managed by Federally Funded Research and Development Centers, industry, academia, and other Federal or non-Federal government organizations used to support a DON activity.
 - COTS, GOTS, and new M&S tools used to train, develop, test, implement, monitor, analyze, or manage models and simulations.
- M&S data needed to verify M&S requirements, build the conceptual model, validate the M&S, perform experiments, and run combat support M&S decision aids.



PROCESS



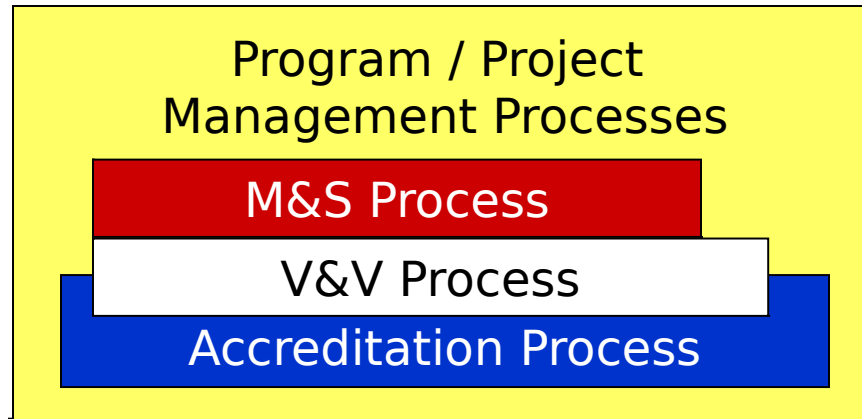
M&S Process



VV&A Process



Process Relationship



- Distinct, but intertwined and related processes
- Management should encourage close coordination between the VV&A and M&S processes



Plan & Document

□ **Identify Intended Use**

- Cooperatively develop, define, and derive requirements for the use of the M&S
- Address user, simulation, and problem domains
- Source documents: Operational Requirements Document, Test Plan, System Performance Specification, etc.

□ **Accreditation Plan**

- Develop Acceptability Criteria from perspective of M&S requirements
 - Qualitative or quantitative measures of merit that some aspect of the required M&S performance is satisfied
 - Should be measurable
 - Document methodology for accrediting the M&S

□ **V&V Plan**

- Document V&V methodology for satisfying Acceptability Criteria
- Tailor activities as appropriate - M&S V&V should not duplicate V&V conducted as part of the development process



Data V&V

5 Types of Data

Reference. Descriptive information (metadata) including administrative, descriptive, and quality.

Hard-wired. Data values implemented in code.

Instance. Input and output data.

Validation. Real world facts.

Exchange. Data exchanged across a federation or distributed simulation.

- Data verification ensures the data selected are the most appropriate for the application and are properly prepared for use in the M&S.
- Data validation ensures the data accurately represent aspects of the real world to be simulated.
- What data require V&V? All data needed to:
 - Verify M&S requirements
 - Build the conceptual model
 - Validate the M&S
 - Perform experiments
 - Run combat support M&S decision aids



Validate Conceptual Model

What is a Conceptual Model?

Assumptions, algorithms, and architectures that relate elements of an M&S to one another. Describes data used by, embedded in, or produced by the M&S.

Validation Tasks

Determine M&S requirements are valid for the intended use

Check for completeness and correctness

Determine conceptual model elements are traceable to the acceptability criteria and M&S requirements

Determine data used are valid data

Identify authoritative data needed to validate the M&S results

Report discrepancies to the M&S Proponent and



Verify Design

Specifications

Translation of the conceptual model to performance requirements in terms of technical performance and mission requirements/capabilities.

Functional Design

Blueprint that translate the M&S system specification into a design used to build the M&S

Verification Tasks

- Determine performance characteristics support intended use
- Establish consistency and faithfulness to the validated conceptual model and traceability
- Ensure required features, functions, behaviors, algorithms, and interactions are correctly and completely represented
- Perform design walkthroughs
- Document results in the V&V Report and report discrepancies to the M&S Proponent



Verify Implementation

Integration, Testing, and Review of M&S and related data as a system.

Verification Tasks

- Demonstrate the M&S system accurately represents the M&S design
- Trace system components back to system design, specification, conceptual model, acceptability criteria, and M&S requirements
- Verify hardware and hardware configuration
- Verify software code
- Perform algorithm checks and verify transformations
- Verify development acceptance test plans and procedures
- Document results in the V&V Report and report discrepancies to the M&S Proponent



Validate Results

- Determine extent the M&S addresses requirements
- Identify how realistic outputs are
- Document how well the simulation fits the intended use

Validation Tasks

Identify scenarios, validation data, and expected results

Compare outputs to real world data

Compare outputs with SME opinion when empirical data is not available

Identify key SMEs

Trace M&S performance to acceptability criteria and M&S requirements

Adjudicate errors

Document results in the V&V Report and report discrepancies to the M&S Proponent



Document & Decide

□ V&V Report

- Document formal V&V evidence
- Capture findings, assumptions, capabilities, limitations, conclusions, and recommendations

□ Accreditation Report

- Summarize M&S capabilities, assumptions, and limitations with regard to the intended use
- Address how Acceptability Criteria were met/unmet
- Provide accreditation recommendation

□ Accreditation Decision Letter

- Consists of the accreditation option with details of caveats, qualifications, constraints, and limitations for use



Requirements Traceability

**Operational
Requirements**

System Performance

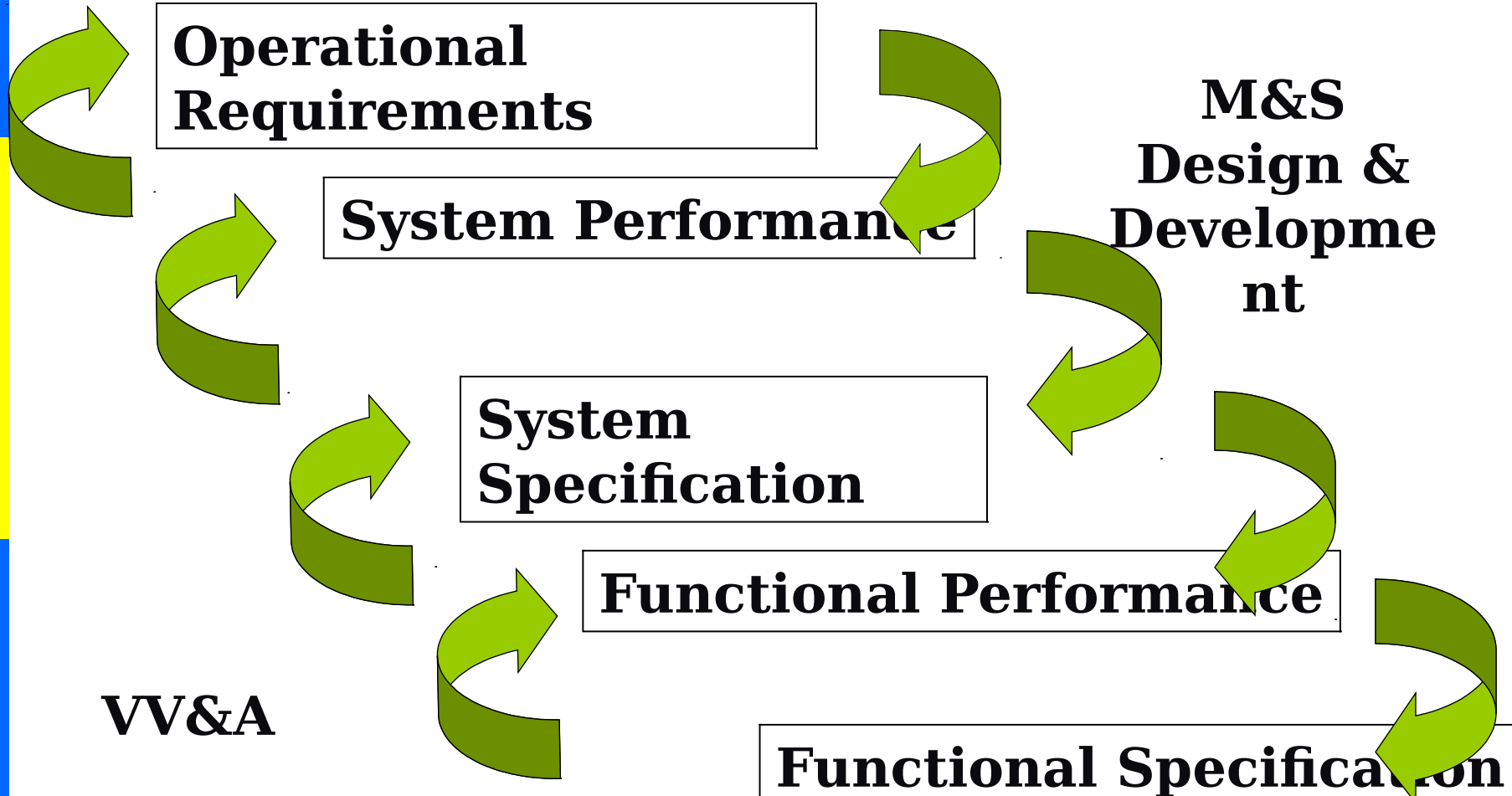
**System
Specification**

Functional Performance

Functional Specification

**M&S
Design &
Development**

VV&A

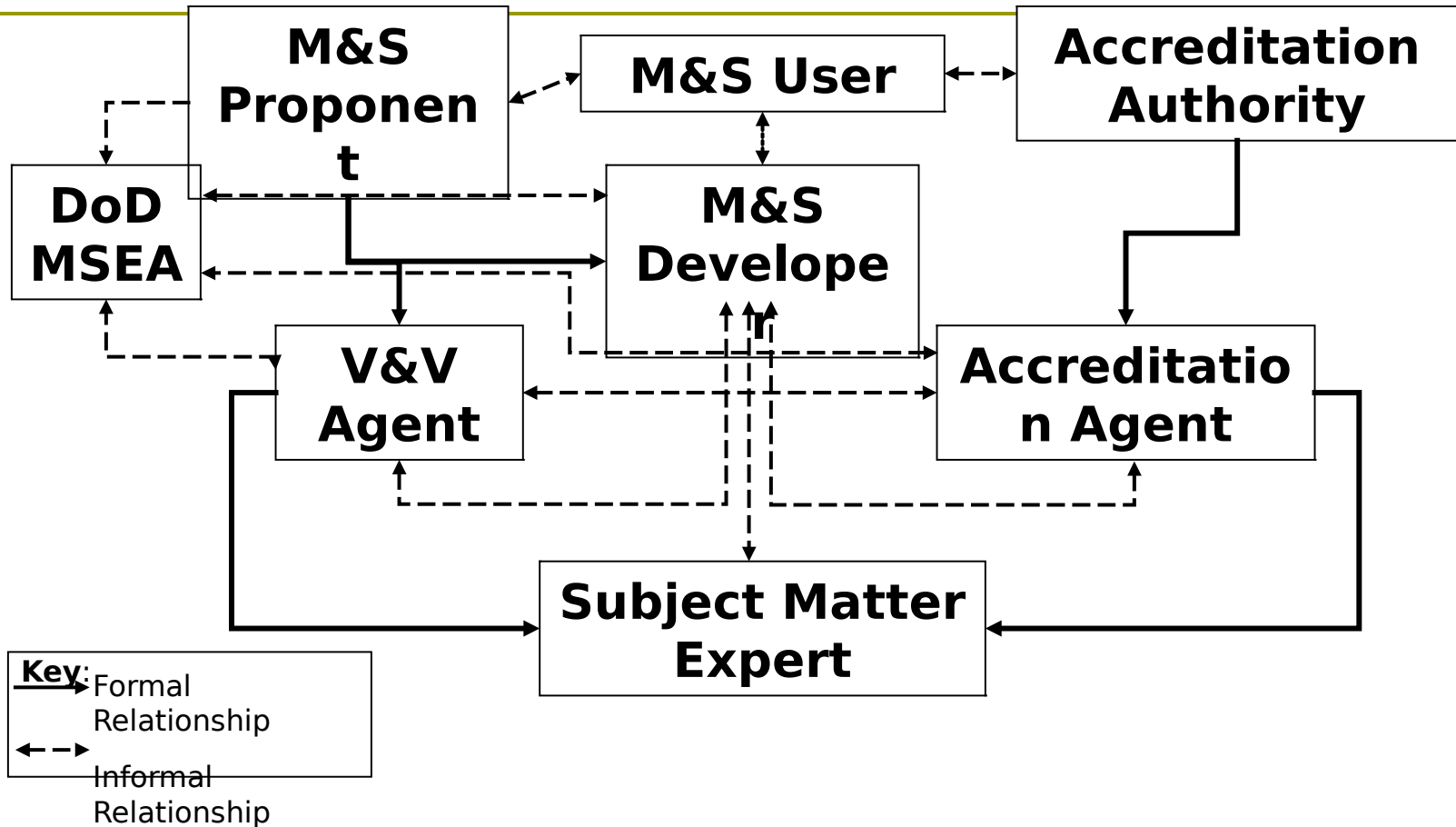


ROLES &

RESPONSIBILITIES



Role Relationships





M&S User

- The individual, group, or organization that uses the results or products from a specific application of an M&S. (***The M&S User is a Government entity.***)
- M&S User shall:
 - Plan, **budget**, and **fund** the implementation of VV&A and the use of accredited M&S.
 - Coordinate with the Accreditation Authority and the M&S Proponent to develop and approve the M&S requirements.

*Section 5.k, draft SECNAVINST
5200.40A*



Accreditation Authority

- The individual responsible to approve the use of an M&S for a particular application. The Accreditation Authority represents the M&S User's interests. **(The Accreditation Authority is a Government entity.)**
- Accreditation Authority shall:
 - Support the M&S User by determining the appropriateness of the application of a M&S for an intended use.
 - Assist the M&S User and the M&S Proponent with defining the M&S requirements and establish the acceptability criteria.
 - Develop, document, and implement the Accreditation Plan.
 - Ensure that adequate V&V procedures have been implemented and the results documented prior to the use of M&S capabilities.
 - Make and document the accreditation decision to apply a model or simulation for specific purpose.
 - Document accreditation summary information in the NMSIS and update the information annually. Forward copies of all accreditation documents to the NAVMSMO for archiving.



M&S Proponent

- The organization that has primary responsibility to initiate planning, development, configuration management, maintenance, and use of an M&S. ***(The M&S Proponent is a Government entity.)***
- M&S Proponent shall:
 - Plan and budget for implementation of V&V.
 - Follow M&S directives and policies.
 - Develop, document, and implement the V&V and configuration management plans for M&S undergoing accreditation.
 - Coordinate and communicate with the M&S User and the Accreditation Authority. Coordinate with the DoD-appointed M&S Executive Agents that serve as the final validation authority for environmental, threat, and intelligence process representations.
 - Document V&V summary information in the NMSIS and update the information annually. Forward copies of all V&V documents to the NAVMSMO for archiving.



Other Key Roles

- **Accreditation Agent:** The individual, group, or organization designated by the Accreditation Authority to conduct an accreditation assessment for an M&S.
 - Plan, manage, conduct, and document the accreditation assessment
 - Coordinate with other key VV&A players
 - Develop an accreditation recommendation for the Accreditation Authority
- **V&V Agent:** The individual, group, or organization designated by the M&S Proponent to verify and validate an M&S.
 - Plan, manage, conduct, and document the V&V of the M&S
 - Coordinate with other key VV&A players
- **Subject Matter Expert:** An individual who, by virtue of education, training, or experience, has expertise in a particular technical or operational discipline, system, or process.
 - Assist with defining M&S requirements for the intended use
 - Assist with accreditation planning and assessment
 - Assist with V&V planning and V&V implementation



V&A Roles & Responsibilities

	M&S User	Accred. Authority	Accred. Agent	M&S Proponent	V&V Agent	M&S Developer	SME
Define M&S Requirements	Lead/ Approve	Review	Assist	Review	Assist	Assist	Assist
Acceptability Criteria	Assist	Approve	Lead	Review	Assist	Assist	Assist
Accreditation Plan	Review	Approve	Lead	Monitor	Review	Review	Assist
V&V Plan	Review	Monitor	Review	Approve	Lead	Review	Assist
V&V Implementation	Review	Monitor	Monitor	Approve	Lead	Assist	Assist
V&V Data	Review	Monitor	Monitor	Approve	Lead	Assist	Assist
V&V Report	Review	Monitor	Monitor	Approve	Perform		Assist
Accreditation Package				Approve	Perform	Assist	
Accreditation Assessment	Monitor	Monitor	Lead				Assist
Accreditation Report	Review	Approve	Perform				Assist
Accreditation Decision	Review	Perform	Assist				
VV&A Archive & M&S Catalog	Perform	Perform		Perform			
Accredit For Reuse	Review	Approve	Lead	Assist	Assist	Assist	Assist
Accreditation Status	Perform						



SUPPORT ACTIVITIES



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navy modeling & simulation management office

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SITE INDEX

RELATED SITES

Welcome to the **Navy Modeling and Simulation Management Office (NAVMSMO)**. This NAVMSMO web site serves as the web-enabled single point of public access to the Navy's Modeling & Simulation Information Service (NMSIS). The NMSIS collects, maintains, and distributes information about Navy Modeling and Simulation (M&S) for the use of Program Managers, engineers, M&S builders, and others throughout the M&S community.

Navy Modeling & Simulation Management Office (NAVMSMO)
2000 Navy Pentagon PT 5486
Washington, DC 20350-2000

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Attend the 8th NAVMSMO TIM!
The 8th NAVMSMO Technical Interchange Meeting on Modeling & Simulation Concepts for FORCEnet will be held June 25, 2002. View [TIM Details](#), [Agenda](#), and [register to attend](#).

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RELATED SITES

Verification, Validation, and Accreditation

NAVMSMO manages a VV&A program that complements the [SECNAV 5200.40](#). The VV&A program provides VV&A guidance for Navy Modeling and Simulation users and providers. Key elements of the program include:

- [VV&A Policy - SECNAVINST 5200.40](#)
- [VV&A Guidance](#)
- [VV&A Technical Working Group \(TWG\)](#)
- [Archived List of VV&A Documents](#)
- [VV&A Help Desk](#)

Send comments and suggestions to wa@navmsmo.hq.navy.mil.

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VV&A Program Manager: CNO-OPNAV N80M3, vva@navmsmo.hq.navy.mil, (703) 601-1497

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NAVMSMO VV&A Products



- DON M&S VV&A Implementation Handbook Approved as Navy M&S best practices guide in Apr 2001 (**under revision**)
 - Volume I - VV&A Framework
 - Volume II - Detailed information of VV&A Process
 - Volume III -Case studies/lessons learned
- VV&A Turbo Documentation Tool
 - Build 1 released 2003
- VV&A Document Archive
 - Approximately 200 VV&A-related documents
 - Listing posted on NAVMSMO VV&A web-page
- VV&A Technical Area Group
 - Standards identification group
- VV&A Help Desk: vva@navmsmo.hq.navy.mil
- VV&A Needs & Solutions



Summary

- NAVMSMO provides leadership for Navy's M&S VV&A efforts
 - Provides policy, plans, and implementation guidance
 - Coordinates common Navy M&S VV&A needs
 - Represents Navy in coordination of VV&A matters with DoD, Services, and Agencies



Customer Input

- ❑ Please discuss your VV&A issues or needs
- ❑ Include your needs for additional VV&A information, services, products, or advocacy
 - What would help you the most in understanding VV&A and implementing it in your organization?
- ❑ Share lessons learned from your VV&A implementation activities
- ❑ If you have an M&S advocate in your organization, tell us who it is.
- ❑ Don't hold back. If you have something VV&A-related to get off your chest, now is the time!